Jan Drugowitsch

CONTACT INFORMATION

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OBJECTIVE

My objective is to stay in research, either in industry or academia. My general interests are computational neuroscience and artificial intelligence, with emphasis on the application of statistical methods to provide well-founded methods and approaches. In neuroscience these are facilitated to define and investigate optimal decision making and its neural correlates. In artificial intelligence I am interested in the application of statistically sounds methods to the detection of pattern in data, and in the use of these detected pattern for further prediction. My research is currently theoretical in nature, but due to my broad education (computer science, cognitive sciences, mechanical engineering, architecture, economics) I am able to apply my knowledge to a wide range of applications. I want to emphasise, however, that my interest in application comes from the researcher's point-of-view: I am interested in difficult problems, and aim for novel solutions that excel current methods.

RESEARCH INTERESTS

Computation neuroscience, artificial intelligence, machine learning, decision theory, reinforcement learning, evolutionary computation, learning classifier systems, model analysis

EDUCATION

University of Bath, Bath, UK **Oct 2004 – Aug 2007**

PhD, Computer Science

- Dissertation Topic: "Learning Classifier Systems from First Principles: A Probabilistic Reformulation of Learning Classifier Systems from the Perspective of Machine Learning"
- Supervisor: Alwyn M. Barry
- Shortlisted for the Ede and Ravenscroft prize for the best postgraduate research student of the University of Bath, 2007

University of Reading, Reading, UK **Oct 2001 – Jul 2004**

BSc Intelligent Systems, Cybernetics, Computer Science and Psychology

- Graduated first class
- Best student of the Faculty of Science 2002, 2003, 2004 (1,200 students per year)
- Cybernetics Prize: Best general BSc performance, Department of Cybernetics, 2004
- George Reynolds Prize: Best first year performance, Department of Cybernetics, 2002
- Top 5% Department of Psychology, 2002, 2003
- Nuffield Foundation Grant, Final Year Project, Summer 2003

London School of Economics, London, UK **Aug 2001**

Summer school, course in Introductory Microeconomics

- A+ on final exam

Graz University of Technology, Graz, Austria **Oct 1996 – Jul 2001**

Finished 1st part (BArch level), Architecture

Higher Technical School for Mechanical Engineering, Wels, Austria **Aug 1991 – Jul 1996**

Graduated A-level with honours

Grants and Awards

Shortlisted for the Ede and Ravenscroft prize for the best postgraduate research student of the University of Bath, March 2007

Nominated for the Best Paper Award, Genetic and Evolutionary Computation Conference (GECCO) 2007, June 2007

European Coordinating Committee for Artificial Intelligence (ECCAI) Travel Award for attending European Conference of Artificial Intelligence (ECAI) 2006, August 2006

Royal Academy of Engineering International Travel Grant for attending Genetic and Evolutionary Computation Conference (GECCO) 2005, June 2005

Genetic and Evolutionary Computation Conference (GECCO) 2005 Student Travel Grant for attending the conference, June 2005

Cybernetics Prize for best general BSc performance, Department of Cybernetics, University of Reading, June 2004

Nuffield Foundation Undergraduate Research Bursary for work on expert communication ambiguity resolver using statistical natural language processing methods, Summer 2003

George Reynolds Price for best first year performance, Department of Cybernetics, University of Reading, June 2002

Books

Jan Drugowitsch. Design and Analysis of Learning Classifier Systems: A Probabilistic Approach, 2008, Springer.

Journal Articles

Jan Drugowitsch and Alwyn M. Barry. A Formal Framework and Extensions for Function Approximation in Learning Classifier Systems. Machine Learning, 70(1), pp. 45–88, 2008, Springer.

Refereed Book Chapters

Jan Drugowitsch and Alwyn M. Barry. A Principled Foundation for LCS. In Learning Classifier Systems, 10th International Workshop, IWLCS 2006, and 11th International Workshop, IWLCS 2007, Revised Selected Papers. Lecture Notes in Computer Science, 4998. pp. 77–95, 2008, Springer.

Daniele Loiacono, Jan Drugowitsch, Alywn M. Barry, and Pier Luca Lanzi. Analysis and Improvements of the Classifier Error Estimate in XCSF. Learning Classifier Systems, 10th International Workshop, IWLCS 2006, and 11th International Workshop, IWLCS 2007, Revised Selected Papers. Lecture Notes in Computer Science, 4998. pp. 117–135, 2008, Springer.

Refereed Conference/ Workshop Papers

Jan Drugowitsch and Alwyn M. Barry. Mixing Independent Classifiers. In Proceedings of the 9th annual conference on Genetic and evolutionary computation (GECCO), pp. 1596–1603, 2007, ACM Press — Nominated for Best Paper Award.

Jan Drugowitsch and Alwyn M. Barry. A Principled Foundation for LCS. In Proceedings of the 2007 GECCO conference companion on Genetic and evolutionary computation, pp. 2675–2680, 2007, ACM Press.

Jan Drugowitsch and Alwyn M. Barry. Towards Convergence of Learning Classifier Systems Value Iteration. Evolutionary Computation Workshop at the European Conference of Artificial Intelligence (ECAI), 2006.

Daniele Loiacono, Jan Drugowitsch, Alwyn M. Barry, and Pier Luca Lanzi. Improving Classifier Error Estimate in XCSF. In The Ninth International Workshop on Learning Classifier Systems, IWLCS-2006, 2006.

Jan Drugowitsch and Alwyn M. Barry. XCS with Eligibility Traces. In Proceedings of the 2005 conference on Genetic and evolutionary computation, pp. 1851–1858, 2005, ACM Press.

Joanna J. Bryson, Tristan J. Caulfield and Jan Drugowitsch. Integrating Life-Like Action Selection into Cycle-Based Agent Simulation Environments. In Proceedings of Agent 2005: Generative Social

Processes, Models, and Mechanisms. Michael North, David L. Sallach and Charles Macal eds., Argonne National Laboratory. pp. 67-82, 2005

Conference Presentations and Invited Talks

Mixing Independent Classifiers. Genetic and Evolutionary Computation Conference (GECCO) 2007, London, UK. July 9, 2007.

A Principled Foundation for LCS. International Workshop on Learning Classifier Systems (IWLCS) 2007, London, UK. July 8, 2007.

Putting Machine Learning into Genetic-based Machine Learning ... and vice-versa. Finalist Presentation for the Ede and Ravenscroft Prize 2007, University of Bath, UK. May 25, 2007.

Towards Convergence of Learning Classifier Systems Value Iteration. Evolutionary Computation Workshop at the European Conference on Artificial Intelligence (ECAI), 2006, Riva del Gara, Italy. August 2006.

A Generalised View on LCS. Seminar for the Learning Classifier Systems Group, University of the West of England, Bristol, UK. June 2006.

Learning Classifier Systems as an Evolutionary Computation Approach to Simulation-based Dynamic Programming. Seminar for the Bath Institute of Complex Systems (BICS), University of Bath, UK. April 2006.

XCS with Eligibility Traces. Genetic and Evolutionary Computation Conference (GECCO) 2005, Washington D.C., USA. June 2005.

Learning Classifier Systems and Reinforcement Learning in Multi-Step Environments. Seminar for the Learning Classifier Systems Group, University of the West of England, Bristol, UK. February 2005.

Academic Experience

University of Rochester, Rochester, NY, USA **Oct 2007 – present**

Postdoctoral Research Fellow (Advisor: Alexandre Pouget)
The aim is to model the neural basis for decision making, in particular with respect to multi-modal integration and reaction time. Optimality in the Bayesian sense is assumed as the basis for this work, and the task is to find network implementations that conform to this optimality and at the same time to sufficiently reflect experimental data in the form of neural recordings, performed by other researchers. Inclusion of the reaction time component requires the introduction of a cost function and the use of decision theory to define the optimal reaction time / accuracy tradeoff.

University of Bath, Bath, UK **Oct 2001 – Jul 2007**

Graduate Student (Supervisor: Alwyn M. Barry)
My work concernd developing a formal framework for a machine learning method called Learning Classifier Systems (LCS), merging genetic algorithms and reinforcement learning. The aim was to provide a functional description of LCS – in contrast to the common algorithmic description – in order to develop a formal framework that facilitates their analysis and highlights links to other statistical learning methods in order to provide knowledge transfer between different communities. Missing adequate prior work, the framework was build from scratch, founded on Bayesian statistics, and capture all fundamental components of Learning Classifier Systems. Formalising LCS is considered adventurous, but my work has only received praise from fellow scientist. Parts of it have been published as a book and have appeared in major international journals.

Tutor
Duties include leading weekly tutorials and computer lab exercises, office hours, marking coursework and exams

- CM20145 Database Systems, fall terms 2004, 2006, 2006
- CM50176 Databases, fall terms 2005, 2006
- CM10020 Computability and Decidability, spring terms 2005, 2006

Graz University of Technology, Graz, Austria **Oct 2000 – Jul 2001**

Tutor
Duties included leading weekly computer lab exercises, coursework support

- Computer Application for Architects

Professional Activities

Conference Organisation

International Workshop on Learning Classifier Systems (IWLCS 2009)
Elected member of the organising committee for the twelfth international workshop on Learning Classifier Systems (IWLCS 2009). Tasks include writing the workshop proposals, assembling the program committee, managing the paper review process, and organising the workshop schedule, before and during the workshop.

Conference Program Committees and Journal Reviews

Paper Reviews for the following journals:
- IEEE Transactions on Evolutionary Computation

Member of the Program Committee
- Genetic and Evolutionary Computation Conference (GECCO) 2007–2009
- International Workshop on Learning Classifier Systems (IWLCS) 2006–2009

University of Bath, Bath, UK **Jan 2006 – Apr 2007**

Part-time lead programmer for Behaviour-Oriented Design Toolkit
Implementation and maintenance of a software package that is based on Behaviour-oriented Design developed by the Bath academic Dr. Joanna Bryson. Most of the package is written in Python for RAD, with links to Java code and other applications over network sockets. My tasks included a re-implementation of an action-selection technique with a different scheduler back-end than previously used, a re-designed file parser, and fixing bugs of the previous implementation. In addition, I was working closely with researchers using the tools to support their use of the software and to implement additional features on request.

Voest-Alpine Industrieanlagenbau, Linz, Austria **Jul 2004 – Aug 2004**

Software Developer for Internal Productivity Tools
Developing parts of a tool to numerically evaluate the torque required to tilt a vessel containing liquid steel, in particular developing a surface mesher for rotational surfaces, including open-source tetrahedron generator, creating the concept and framework for the GUI. Final application now in full use, significantly improving functionality and replacing an outdated text-based version.

University of Reading, Reading, UK **Summer 2002, 2003**

Summer Researcher
Project work on expert communication ambiguity resolver initiated by National Grid. Using statistical natural language processing techniques, since April 2003 same project adopted as final year project (Department of Cybernetics, University of Reading), Nuffield Foundation Undergraduate Research Bursary granted for the summer period 2003.

Plottegg Architects, Graz, Austria **Nov 2000 – Jun 2001**

System and Network Administrator
Administrating domain, file and printing servers running Windows NT4.

Languages

- German: native, English: fluent, Spanish, French: basics

Computer Skills

- Languages: C++, Java, Python, Delphi (good knowledge), Perl, Lisp, Prolog, POP-11, x86 Assembler, SQL (basics)
- Applications: Maple, Mathematica, common office products, software related to architecture (AutoCAD, Photoshop, 3D Studio Max)
- Operating Systems: Unix/Linux (networking, administration), Windows

Extracurricular Activities

- Founder and co-organiser of the Bath Artificial Intelligence (BAI) reading group, topics in AI from philosophical and cognitive perspective
- Piano (for 15 years), composing, use of synthesizer, sequencing software
- Scull (two times 4th rank at Austrian state championship, skiff class), sports in general
- Travelling (Africa, Asia, South America, North America, Australia)
- Dancing (previously member of the Reading University Dance Club Team, vice team captain 2003/2004)
- Interact Club Wels 1990–1996 (belonging to Rotary Club — established for pupils aged 14-19), president 1994–1996, secretary 1993